The Microphone for Military and Tonometric Purposes

MY attention has just been called to a paper on the microphone, by Prof. W. F. Barrett, in NATURE (vol. xix. p. 12), in which it is asked whether the latter "has ever been tried by military men to detect the mining operations of an enemy?" Will you allow me to state that this application of the microphone suggested itself to me many months ago, and that I have begun to make experiments both in this direction and also with a view to ascertain to what extent sounds can be transmitted to a microphone immersed in water. Unfortunately the pressure of other matters has hindered me from completing the work, which, however, I hope shortly to be able to do.

May I take this opportunity of saying that I have been endeavouring with some success to apply the principle of the microphone to the counting of the beats of two slightly dissonant tuning-forks. In one experiment the two forks were inverted and screwed through a board above which the ends of their stems protruded. A thin piece of carbon was laid over these ends and the arrangement was placed in circuit with a Bell telephone. The beats were loudly heard and continued audible long after their direct sound had ceased. A reflecting galvanometer being placed in the circuit the beats were shown by deflections of the light spot, but irregularities in the current made it difficult to count them satisfactorily. The forks were then screwed horizontally into a vertical board and a screw was inserted about 1″ from the stem of each and on the same horizontal level. A small piece of carbon was laid over each stem and its adjacent screw. This plan gave even better results, and admits of the forks being any reasonable distance apart. The experiments were tried with two forks whose vibration numbers were about 60, and also with a pair of octave forks with vibration numbers of about 256 and 512. A small piece of copper wire was then attached to each of the two large forks, and mercury cups were so placed that the points of the wires were just not touching the mercury surface when the forks were at rest. Both mercury cups were connected to one pole of the battery, and the current was arranged to branch through the forks uniting at the telephone. The beats were very loud. This plan, however, involves difficulties on account of the delicacy of adjustment required for the mercury surfaces and also the amalgamation of the copper-points. Several other experiments have been tried, but the method first described seems worth a trial by those interested in tonometry. The counting of beats, which is not an easy matter for aged or unaccustomed ears, may thus be immensely facilitated, while the period of the forks under observation is absolutely unaffected. The carbon used was that employed for the electric light, and it is probable that more carefully prepared and homogeneous material would have given better results in a galvanometer experiment.

GEORGE S. CLARKE

Cooper's Hill, November 19

The Microphone as a Receiver

ON the 3rd of June last, in a paper read before the Royal Society of Edinburgh, I described an experiment which showed that the microphone could be used, not only as a transmitter, but also as a receiver of articulate sounds. An abstract of the paper appeared shortly after in NATURE, and since then I have had communications from several experimenters, stating that they had failed to repeat the experiment, and asking for some details regarding it. I trust, therefore, that you will kindly give me space for a short explanation.

In performing the experiment the transmitting and receiving instruments which I used were precisely identical. Each was merely an ordinary white porcelain jam-pot, 3½ inches in diameter and 4 inches deep, half filled with gas-coke, broken into coarse fragments and provided with electrodes whereby a current of electricity could be sent through the pieces of coke. Cinders from ordinary coal, if well burned, would, of course, do equally well. The electrodes were two strips of tin about two inches wide slipped down, opposite to each other, between the cinders and the sides of the jam-pot and fastened by being bent over the edges and bound round the outside with a cord. When these jam-pots were put in circuit like a pair of ordinary telephones, and a battery of two strong Grove's cells, or four ordinary Bunsen's, included in the circuit the arrangement was complete.

In this way I have had no difficulty in making myself and others clearly hear the transmission both of singing and speaking, although, as I stated in my paper, the articulation is not so distinct as I have no doubt it will be when proper forms both of transmitter and receiver are adopted.

I may mention that since then I have found the result to be greatly improved by including a stronger battery in the circuit.

Edinburgh, November 18 JAMES BLYTH

Wind-Pressure

I BECAME acquainted, some years since, with the singularly great wind-pressures registered at the Liverpool Observatory, and I should be rather disposed to attribute them to the exceptional position of the wind-gauge than to think (as the writer of an article in NATURE, vol. xix. p. 25, appears to do) that the gauge is erroneous. I do not remember to have seen it noticed, in the recent discussions on the Cleopatra's Needle, that there is probably a rapid increase of wind-pressure from the ground-surface upwards. In any river the velocity is least at the bottom, and near the bottom the change is rapid. Similarly, in the great current formed by the wind, I imagine there is a much less velocity near the ground than at some distance above it, and less on a plain than above a hill standing out of the plain. Now I believe the Bidstone Observatory is on a hill, with the great plain formed by the Atlantic in front of it. It is, therefore, in a position in which it receives an exceptionally heavy wind-pressure. The pressure on the wind-gauge is probably much greater than on the windows of the observatory, and that, again, is probably greater than the pressure on buildings more inland, where the current near the ground has been more interfered with by obstructions. On the other hand, Cleopatra's Needle is in a very protected position, where I should be much surprised to find that the wind-pressure ever reached even 40 lbs. per square foot.

As Mr. Dixon has referred to the case of a window to disprove the possibility of a pressure of 80 lbs. per square foot, it may be well to see whether it is really conclusive. I have not at hand any formula for the resistance of a simply-supported square plate, but it will not be very different from that of a circular plate. Now, let p = pressure per square inch on surface of plate, t its thickness, r its radius. Then the greatest stress in the plate is by Grashof's formula, $f = \frac{5}{6} \cdot \frac{r^2}{t^2} p$. Taking a plate of glass 2 feet diameter, ⅛ inch thick, and loaded with 80 lbs. per square foot, we get $f = 4{,}270$ lbs. per square inch. In some experiments which I made under Sir W. Fairbairn's direction, the tenacity of glass was found to be from 4,200 to 6,000 lbs. per square in. Hence, surprising as it may seem, it is probable that a pane of glass 2 feet diameter would sustain a load of 80 lbs. per square foot, uniformly distributed, without breaking, or a load equivalent to that of a dense crowd of people. I don't, of course, think that a window would be safe if subjected to such a pressure, but it is always desirable to subject general statements of this kind to exact calculation; and I think we may at least infer that well-constructed glass windows would sustain a considerable wind-pressure without necessarily giving way.

W. C. UNWIN

Cooper's Hill, November 17

Was Homer Colour-blind?

I CRAVE some little space for a few remarks with regard to the recently much vexed question as to the traditional blindness of Homer.

It seems to have been overlooked that, apart from the statement made by Herodotus[1] (in his life of Homer), that in

[1] Homer, according to Herodotus, was born about 167 years after the Trojan war and, when still a child, adopted by his stepfather, to whom he succeeded in the management of a school. At an early age, however, it would seem, he set out for distant voyages and, at length, after having spent some time on visiting Tyrrhenia and Iberia, when about 32 or 34 years of age, lost his sight from what appears to have been some chronic disease of the eyes. Previously, when at Ithaca, he is said already to have had a narrow escape from that calamity. The text of this important narrative runs thus :—

. . . . οἱ μὲν Ἰθακήσιοι λέγουσι, τότε μὲν παρ' ἑαυτοῖς τυφλωθῆναι, ὡς δὲ ἐγώ φημι τότε μὲν ὑγιῆ γενέσθαι, ὕστερον δὲ ἐν Κολοφῶνι τυφλωθῆναι; συνομολογοῦσι δὲ μοι καὶ Κολοφώνιοι τούτοις . . . . . Ἀπικομένω δὲ ἐς Κολοφῶνα συνέβη, πάλιν νοσήσαντα τοὺς ὀφθαλμοὺς μὴ δύνασθαι διαφυγεῖν τὴν νόσον, ἀλλὰ τυφλωθῆναι ἐνταῦθα. Ἐκ δὲ τῆς Κολοφῶνος τυφλὸς ἐὼν ἀπικνέεται εἰς τὴν Σμύρναν . . . .

From Colophon he sailed to Smyrna, where, for his sustenance, he began and, afterwards, continued, during his long wanderings, and for a good many years, the recital of his verses.

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consequence of what appears to have been a chronic disease of the eyes, the poet lost his sight at the early age of about 32 or 34 years, and that he, once at least, styles himself a downright blind man, in his Hymn to Delian Apollo, ver. 169—73, which derives no mean authenticity from being so pointedly quoted by Thucydides, III., 104, and which runs thus :—

ὁππότε κέν τις ἐπιχθονίων ἀνθρώπων
. . . .
ἐνθάδ' ἀνείρηται ξεῖνιος ταλαπείριος ἐλθών·
ὦ κοῦραι, τίς δ' ὔμμιν ἀνὴρ ἥδιστος ἀοιδῶν
ἐνθ' δε πωλεῖται, καὶ τέῳ τέρπεσθε μάλιστα;
ὑμεῖς δ' εὖ μάλα πᾶσαι ὑποκρίνασθ' εὐφήμως·
τυφλὸς ἀνήρ, οἰκεῖ δὲ Χίῳ ἔνι παιπαλοέσσῃ,
τοῦ πᾶσαι μετόπισθεν ἀριστεύουσιν ἀοιδαί.

If some day an earthborn man, a wayfaring stranger,
Asks you the name of whom best you like of all the minstrels you know,
Whose songs are, oh lasses, the most delightful to you,
Oh, then, unanimously, surely, you answer :
It is the blind man who dwells in the rocky island of Chios,
His songs are to us by far the sweetest of all.

I need not add, as a further argument, that Homer frequently was alluded to as the blind and humpbacked man, ὁ κυφὸς καὶ τυφλὸς ἀνήρ,[1] and it seems to me trifling to qualify, or mitigate, the racy juxtaposition of the two epithets.

To what extent colour hallucinations, so frequent in connection with certain forms of blindness, may possibly have impaired the poet's imaginative faculties with regard to the varying hues and shades of colour, it would be for the present, from want, for obvious reasons, of similar observations, difficult to settle. However, I cannot but think that what by some so recently has been called Homer's colour-blindness may be the natural consequence, on the one hand, of the increasing dimness of his recollections as well as owing to these optical hallucinations, and finally, to the defective chromatic terminology of his time. The following are some of the Greek and Latin authors who, together with Herodotus, aver and enlarge upon the blindness of Homer :—Plutarch, Vita Hom. 12 ; Thucyd., III. 104 ; Pausan., II. 33, 3 ; III. 4, 33 ; Lycophron, Cassandra, 422 ; Aristot., Orat., L. p. 703 ; Cicero, Tuscul, V. 39.

I refrain from discussing the question whether, from a physiological point of view, such a profound functional perturbation as is involved in the term of colour-blindness, viz., deficiency in the perception of any plurality of colours in the spectrum, would not seem to be symptomatical of most momentous organic disturbances in the nervous apparatus of the eye, generally conducive to the most hopeless forms of blindness.

Scientific Club J. HERSCHEL

IN reading Mr. Pole's article on Homer's sensations of colour, there is one point which seemed to me to call for explanation. Mr. Pole says that in the solar spectrum he sees only two colours, blue and yellow, and that the red space appears to him yellow. From this one would naturally infer that the whole of the spectrum visible to ordinary persons is visible to him also, but that it presents only these two colours, which graduate into one another without any break, and that the green space appears as yellow. And with a colour-blind person who has allowed me to test his capabilities, I found this actually to be the case. But later on Mr. Pole says that pure red and pure green appear to him not yellow but grey. I would wish, then, to ask Mr. Pole whether the spectrum presents to his vision, in place of the green, a neutral space or an interval of darkness? In other words, have the rays of that particular refrangibility no action at all upon his retina, or is it that they have no action peculiar to themselves, but simply produce the general effect of light? In either case the phenomenon seems more anomalous than if he saw all colours as colours, though he could only class them under two heads. To take a familiar analogy, it is as if a man should be perfectly able to distinguish the pitch of notes at either end of the scale, but the notes between should either not affect the auditory nerve at all, or should affect it simply as noise.

Pembroke College, Oxford FRANK PODMORE

[1] The very word of "Ὁμηρος signified "blind" in the vernacular idiom of Κύμη, or Cumæ, one of the Æolian colonies in Asia Minor, where he lived for some time, and, as will be shown anon, accidentally came by the name of Homer, his original name being Melesigenes, from his happening to be born on the banks of the small river Meles, which flows by Smyrna and runs into the Smyrnean sinus.

One day, pointing out how much of the poet's glory was certain to redound to their own city's glory, if the poet could be induced to settle among them, it was proposed to the people of Cumæ to provide during his lifetime for his wants, at the public expense, when somebody explained that such a resolution would be tantamount to inviting all sorts of blind, Ὁμηροι, and useless, people to their city, whereupon the proposal dropped. But it seems that, henceforth, the poet went by the name of Homer :—

Ὁμηρος ἐπεκράτησε τῳ Μελησιγενεῖ ἀπὸ τῆς συμφορῆς ; οἱ γὰρ Κυμαῖοι τοὺς τυφλοὺς Ὁμήρους λέγουσιν. Ὥστε πρότερον ὀνομαζομένου αὐτοῦ Μελησιγενέος, τοῦτο γενέσθαι τοὔνομα Ὁμηρος.

Herodot. Halic., vita Hom., 2, 13.

Anthropometry

As I have stated in the preface that my object in publishing my "Manual of Anthropometry" is to invite criticism with a view to perfecting the anthropometrical chart which it contains, and which forms its chief feature, I may be excused for referring to the notice of the work which appears in NATURE, vol. xix. p. 29. The reviewer objects to the large number of measurements given in the chart, but he has overlooked my statement that many of them are of a secondary character, and that I leave the student liberty to select the measurements which best suit his purpose, requiring only of him that they shall be made and recorded in a uniform manner, and thus become the common property of statisticians. Anthropometry can make no progress as a science, so long as observers are at liberty to make the same nominal measurement of the body in four or five different ways, as is the case, for instance, with chest-girths.

I may add that my manual was not written for the three or four individuals in this country who have mastered the "theory of human proportions" as a mathematical curiosity, but for army surgeons, busy medical men, schoolmasters, and others who are much more concerned with actual facts than theories of probabilities. CHARLES ROBERTS

Bolton Row, W.

Divisibility of Electric Light

IN all communications on this subject in NATURE and elsewhere, the division of light is considered only with reference to parallel circuits, and this naturally causes great loss of light by the law that heating is proportional to the square of the current. But in electric circuits their resistance has always to be considered ; and if two lamps are taken parallel, only half the resistance of the one lamp is obtained, and such resistance can be obtained by taking two parallel circuits of two lamps in series in each ; the light obtained then is one quarter in each lamp, as half the current is flowing through each circuit, and as four quarters make a whole, no loss of light is caused by division in such a method of one current to any number of lamps. There are certainly practical difficulties in the way of burning lamps in series, though these are greatly diminished if incandescent wire is used as the light-emitting source. However, there is no inherent reason why the electric light should be wasteful in division, as is described by Mr. Trant. F. JACOB

Verification of Pervouchine's Statements regarding the Divisibility of Certain Numbers

THE statements of Pervouchine, reported in some recent numbers of NATURE, are equivalent to the following :—That the 2^{10} power of 16 is less by 1 than some multiple of $7 \times 2^{14} + 1$; and the 2^{21} power of 16 is less by 1 than some multiple of $5 \times 2^{25} + 1$.

Let r_n be the remainder after dividing the 2^n power of 16 by one of the above divisors. Then since the 2^{n+1} power of 16 is the square of the 2^n power, r_{n+1} differs from the square of r_n by a multiple of the divisor ; or r_{n+1} is the remainder arising from the division of the square of r_n.

Use for the work the scale whose radix is 16. In this scale the above divisors are

1 12 0 0 1 and 10 0 0 0 0 0 1.

In the first case, calculating on the plan indicated, we find the remainders.

$r_3 = -$		5	2	4	9
$r_4 = -$	1	11	6	4	13
$r_5 = -$		5	9	10	6
$r_6 = -$		15	10	4	13
$r_7 = -$		1	0	10	15
$r_8 = -$	1	10	8	15	15
$r_9 = -$		14	5	2	11
$r_{10} = -$					1

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